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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/781,445	02/13/2001	Jack H. Winters	2455-4376US2	9556

7590 01/18/2005

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EXAMINER
PHAN, MAN U

ART UNIT	PAPER NUMBER
2665	

DATE MAILED: 01/18/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	09/781,445	WINTERS ET AL.
	Examiner	Art Unit
	Man Phan	2665

OA

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 September 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-22* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-22* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *13 February 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Response to Amendment

1. This communication is in response to applicant's 09/15/2004 Amendment in the application of Winters for the "System and method for selecting a transmission channel in a wireless communication system that includes an adaptive antenna array" filed 02/13/2001. The proposed amendment to the claims has been entered and made of record. Newly claims 19-22 have been added, none of claims is amended. Claims 1-22 are pending in the application.

Remarks

2. Applicant's amendment to the pending claims have been considered but are moot in view of the new ground(s) of rejection, and will be examined as discussed below. Furthermore, the rejections of record under 35 U.S.C. ' 103 of the claims are withdrawn in view of the newly discovered reference to Kapoor et al. (US#6,795,424). Accordingly, This action is made Non-Final. Rejections based on the newly cited reference follows:

Claim Rejections - 35 USC ' 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior

art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1, 2, 5-9 and 10, 11, 14-18 and 19-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Alamouti et al. (US#2003/0156570) in view of Kapoor et al. (US#6,795,424).

With respect to claims 1 and 20, 22, both Alamouti et al. (US#2003/0156570) and Kapoor et al. (US#6,795,424) disclose a method and system for establishing a wireless communication utilizing diversity combining techniques, according to the essential features of the claims. Alamouti discloses a wireless communication system including a receiver having an adaptive array with at least two antennas to receive a signal and produce at least two received signals (paragraphs [0268] and [0269]), a transmitter having at least two transmission channels for communicating the signal from the transmitter to the receiver (paragraph [01 70]), means for suppressing interference at the receiver by applying an interference suppression technique (paragraph [O20O]) and means for selecting a channel (paragraphs [0223] and [0268]). Alamouti do not disclose expressly wherein channel performance be based on a combining technique that differs from the interference suppression technique. However, Alamouti teaches a polarization diversity in various unique combinations for improved fade resistance and to enable a base station to efficiently communicate with many remote stations (See Fig. 1, [0068]-[0076] and [0166]). In the same field of endeavor, Kapoor et al. (US#6,795,424) discloses in Fig.5 a block diagram of an exemplary embodiment of a receiver 60 for the adaptive antenna array architecture 10. The

receiver 60 is capable of correcting for incoming channels which experience fast time-varying fading. The receiver 60 illustrates two stages of an array. Signals from mobile users 51 impinge upon the adaptive array 52 comprised of a plurality of sub-arrays 59 numbered 0 to M. Each sub-array 59 comprises a plurality of elements 54 numbered 0 to S. The number of elements 54 in each sub-array 59 may not be equal. Each sub-array 59 can handle signals from many mobile users 51 at the same time. At each sub-array 59, the signals from mobile users 51 pass through coherent demodulators to beamformers 56 which are supplied with direction of arrival data from the DOA processor 57 in the BS 7 to construct the desired signal response pattern. The DOA processor 57 calculates the direction of arrival in accordance with the method described above in connection with Fig. 3. The output signals from the beamformers 56 are passed through a spatial diversity combiner 58 to remove interference. The output signal from the spatial diversity combiner 58 may be fed into a standard voice or data network (Col. 3, lines 32 plus and Col. 18, lines 50 plus).

It's noted that the effects of fading dips can be mitigated by having multiple receive antennas and by employing some form of diversity combining, such as selective combining, equal gain combining, or maximal ratio combining, wherein signals from each receive antenna are combined to create a single received signal. Diversity techniques take advantage of the fact that the fading on the different antennas is not the same, so that when one antenna receives a fading dip, chances are, another antenna is not. Note Mobile Communications Design Fundamentals by William C. Y. Lee, Howard W. Sams & Co., Ind., USA. In section 3.5.1 of this book, several examples are given describing how signals from two receiver amplifiers with separate antennas can be combined to counteract fading.

Diversity systems are used for fading compensation (See, D. G. Brennan, "Linear diversity combining techniques", Proc. of IRE, Vol. 47, pp. 1075-1102, June 1959.). In a dual diversity system, one symbol is transmitted over two channels and respective signals are combined at a receiver. There are several types of diversity combining techniques in practical use: selection combining (SC), equal gain combining (EGC), and maximal ratio combining (MRC). In the SC technique, a channel with the largest signal to noise ratio is selected. SC is simply implemented with orthogonal signaling and noncoherent demodulation which are frequently used in fading channels (G. Chyi, J. G. Proakis, and C. M. Keller, "On the symbol error probability of maximum selection diversity reception schemes over a Rayleigh fading channel", IEEE Trans. Commun. Vol. 37, No. 1, pp. 78-83, January 1989.). The most efficient communication system design for M-ary orthogonal channels with noncoherent demodulation would employ low rate codes over a Galois field GF(q) with M=q (W. E. Ryan and S. G. Wilson, "Two classes convolutional codes over GF(q) for q-ary orthogonal signaling", IEEE Trans. Commun. Vol. 39, No. 1, pp 30-40, January 1991.).

Regarding claim 2, Alamouti discloses that the receiver must distinguish among different beams within its own cell and signals from other bases (paragraphs [0224] and [0225]). This meets the limitation of a receiver that is able to communicate with multiple transmitters.

Regarding claims 5-9, Alamouti discloses using a measurement of mean-square error for deriving an optimal beamform solution (paragraph [0206]). The beamforming is what provides the interference suppression (see paragraph [0200]). Alamouti also discloses maximal ratio, selection diversity and equal gain as possible combining techniques to be used

at the receiver antenna array (paragraphs [0274], [0276] and [0277]). Furthermore, Kapoor discloses using switched diversity combining at a receiver by measuring the instantreous SNR for each sub-array's output and selecting the best option each symbol time. Kapoor teaches the use of an Adaptive Array (AA) with the elements spaced far apart (5 to 15 wavelengths) to obtain spatial diversity, i.e., independent fading at different antenna elements. The combining method of the preferred embodiment uses maximal ratio combining (MRC) to correct for IBI and Additive white Gaussian noise (AWGN). The MRC is merely a spatial matched filter. If an M element array is used, each bin has a separate M dimensional combining weight vector. To implement MRC, the channel frequency response for each bin may be estimated via periodic pilot sub-symbols. Note that the MRC also subsumes the role of the standard frequency equalization (FEQ) operation (Col. 3, lines 47-53 and Col. 4, lines 27 plus). It's noted that the technique of reducing fading fluctuation is called the diversity combining method, which comes in three basic types, namely, selection combining, equal-gain combining and maximum-ratio combining. In the selection combining, in particular, the least degraded signal is selected and outputted from a plurality of received signals, and the other signals are not used. The selection combining is considered to best serve a practical purpose because the circuit structure of this selection combining is simpler than those of the other two combining methods. Such diversity combining techniques may include Equal Gain Combining (EGC), Maximal Ratio Combining (MRC), Interference Rejection Combining (IRC), etc.

Regarding claims 10, 11, 14-18 and 19, 21, they are method claims corresponding to the apparatus claims 1, 2, 5-9 and 20, 22 above. Therefore, claims 10, 11, 14-18 and 19, 21 are analyzed and rejected as previously discussed with respect to claims 1, 2, 5-9 and 20, 22 above.

One skilled in the art would have recognized the need for effectively and efficiently facilitates operating of the antenna diversity combining techniques in selecting transmission channel, and would have applied Kapoor's novel use of the diversity combining techniques with adaptive array into Alamouti's adaptive antenna array communications system. Therefore, It would have been obvious to a person of ordinary skill in the art at the time of the invention was made to apply Kapoor's method and apparatus for interference suppression in OFDM wireless communication systems into Alamouti's Method for frequency division duplex communications with the motivation being to provide a method and system for establishing a wireless communication utilizing diversity combining techniques.

5. Claims 3-4 and 12-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Alamouti et al. (US#2003/0156570) in view of Kapoor et al. (US#6,795,424) as applied to the claims above, and further in view of Bevan et al. (US#6,415,149).

With respect to claims 3, 4, Alamouti and Kapoor disclose the claimed limitations as discussed in the paragraph 4 above. In the same field of endeavor, Bevan discloses a softer handoff procedure in which the base station uses a diversity combiner to combine signals received from a mobile station in two different sectors (col. 7, lines 29-43). This meets the limitation of a mobile station that acts as a transmitter that transmits on at least two transmission channels.

At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to use the softer handoff procedure of Bevan wherein the mobile station communicates with a base station array receiver over two transmission channels, and Kapoor's novel use of the diversity combining techniques with adaptive array into Alamouti's adaptive antenna array communications system. Therefore, It would have been obvious to a person of ordinary skill in the art at the time of the invention was made to apply Bevan's Method and apparatus for handoff in a cellular radio communications system, and Kapoor's method and apparatus for interference suppression in OFDM wireless communication systems into Alamouti's Method for frequency division duplex communications with the motivation being to provide a method and system for establishing a wireless communication utilizing diversity combining techniques.

Conclusion

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

The Alamouti et al. (US#6,782,039) is cited to show theVertical adaptive antenna array for a discrete multitone spread spectrum communications system.

The Kapoor et al. (US#2002/0105928) is cited to show the method and apparatus for interference suppression in OFDM wireless communication systems.

The Scott (US#6,522,642) is cited to show the antenna diversity techniques.

The Raitola et al. (US#6,445,757) is cited to show the diversity combining method, and receiver.

The Hartikainen et al. (US#6,757,524) is cited to show the diversity reception in a mobile communication system.

The Matsuoka et al. (US#6,771,988) is cited to show the radio communication apparatus using adaptive antenna.

The Sakoda et al. (US#6,363,099) is cited to show the physical channel assignment method and transmitter

The Yun et al. (US#5,886,988) is cited to show the channel assignment and call admission control for spatial division multiple access communication systems.

The Matsumoto et al. (US#5,590,399) is cited to show the up link channel assignment scheme for cellular mobile communications systems employing multi beam antennas with beam selection.

The Barnickel (US#6,052,596) is cited to show the system and method for dynamic channel assignment.

The Eswara et al. (US#6,597,927) is cited to show the narrow beam traffic channel assignment method and apparatus.

The Borst et al. (US#6,640,104) is cited to show the dynamic channel assignment for intelligent antennas.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to M. Phan whose telephone number is (571) 272-3149. The examiner can normally be reached on Mon - Fri from 6:00 to 3:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Huy Vu, can be reached on (571) 272-3155. The fax phone number for the organization where this application or proceeding is assigned is (703) 305-3988.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (571) 272-2600.

8. ***Any response to this action should be mailed to:***

Commissioner of Patents and Trademarks

Washington, D.C. 20231

or faxed to: (703) 872-9314, (for formal communications intended for entry)

Or: (703) 305-3988 (for informal or draft communications, please label "PROPOSED" or "DRAFT")

Hand-delivered responses should be brought to Crystal Park II, 2021 Crystal Drive, Arlington. VA., Sixth Floor (Receptionist).

Mphan

01/12/2005.

Man U. Phan

MAN U. PHAN
PRIMARY EXAMINER